Book Review:

Sociology and Complexity Science, Brian Castellani and Frederick William Hafferty, 2009, Springer: Complexity, Understanding Complex Systems, ISBN: 978-3-540-88461-3

Martin Hilbert
Annenberg School of Communication, University of Southern California (USC);
United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC)

This is the author's version of the book review published as:

Hilbert, M. (2012). Brian Castellani, Frederick William Hafferty, ,Sociology and Complexity Science (2009) Springer 978-3-540-88461-3. Automatica, 48(12), 3187–3188. doi:10.1016/j.automatica.2012.08.002

Sociology and complexity science have long evolved together. In the early 1900s, the economist Vilfredo Pareto's popularized the scale-free powerlaw, in the 1930s Jacob Moreno drew the first applied network graphs (so-called sociograms), in the 1960s Stanley Migram discovered the famous six degrees of separation, in the 1970s Mark Granovetter taught us about the strength of weak ties, and in the 1980s Robert Axelrod demonstrated the complexity of cooperation. These and many other contributions of the social sciences happened before complexity science was established as a field of inquiry by itself (the Santa Fe Institute, which is exclusively dedicated to the study of complex systems, was founded in 1984 for example). Castellani and Hafferty have taken up the long overdue task to examine how both fields, sociology and complexity, have evolved in parallel, and how they are related nowadays.

One of the real strengths of this book is its engagement with the history of sociological thought and literature. In chapters 1 and 2 the authors show how system thinking not only underlines, but has often given birth in sociological inquiry, and the other way around. The authors rightfully stress the role of some of the most influential sociological thinkers (like Marx, Weber, Durkheim, Goffman, Bourdieu, and Giddens), as pioneering system's theorists, and point to the often neglected fact that much of Talcott Parsons' ambitious agenda from the 1950s was already asking many of the right questions (despite the fact that it has never been taken up and evolved by the sociology community). This literature review would make a nice stand-alone introduction to the history and relations among both fields.

The second part of the book introduces a "toolkit" for what the authors dub "Sociology and Complexity Science" (SACS). It consists of a set of theoretical models and analytical methods for studying social systems, including the usual suspects from complexity science (like the analysis of non-linear dynamical systems, complex networks, agent-based modeling, and computer simulations), and five identified main fields of sociological relevance, namely social network analysis, socio-cybernetics, computational sociology, the so-called Luhman School of Complexity (after the influential German systems theorist Niklas

Luhmann, e.g. Luhmann, 2012), and the so-called British-based school of complexity. As a way of demonstrating the utility of the toolkit, the authors interpret the development of SACS as a complex social system itself, and attempt to analyzing the evolution of the field by applying the very same tools and ideas that this field consists of. The ambition to kill various birds with one stone is understandable, but it is often difficult to understand the author's conceptualizations of the tools. Terms like fractals, self-organized criticality, bifurcation, attractors, dissipative structures, and scaling laws have very concrete and clearly defined (mathematical) meanings. Using them as metaphors and analogies for a wide range of dynamics is tempting, but (in the very own words of the authors), since "many scholars, particularly those in the humanities and social sciences lack rigor or reason in their usage of the concepts and ideas of complexity science" (p. 121), the loose usage of these terms always runs the well-known risk of turning a rigorous concepts into hype. In order to be able to distinguish between the rigorous origin of these concepts and their metaphorical use during this second part of the book, the reader has to come pre-equipped with a thorough understanding of the definitions and limitations of the tools of complexity science, and stay open-minded to the rhetorical use of such terms.

The last part of the book is very useful and reads like a who-is-who in the field of sociology and complexity science. Much in the tradition of Newman (2001a, 2001b), the chapter culminates in a quantitative analysis of the cross-citation network of 25 selected scholars from both fields. Unfortunately, in contrary to other current attempts to understand the structure of scientific research communities with the help of social network analysis (e.g. Bollen et al, 2009), the analysis is quite selective and limited in scope, and the analysis seems influenced by the previous qualitative examination of the field.

In short, the book provides a useful historical summary of the entangled nature of sociology and complexity science and provides a qualitative assessment of the related research community during the past ten years. This combination was long overdue, since social systems (which occupy the highest hierarchical level in the dynamical systems) are undoubtedly the most complex of all systems. The book may be best suited to someone who already has a critical understanding of the limits and benefits of the different tools offered by complexity science, is open-minded to metaphorical figures of speech, and interested in learning more about the history, style of reasoning, and current involvement of the sociological agenda with complexity science.

References:

Bollen, J., Van de Sompel, H., Hagberg, A., Bettencourt, L., Chute, R., Rodriguez, M. A., & Balakireva, L. (2009). Clickstream Data Yields High-Resolution Maps of Science. *PLoS ONE*, *4*(3), e4803. doi:10.1371/journal.pone.0004803

Luhmann, N. (2012). *Introduction to Systems Theory*. Polity.

Newman, M. E. J. (2001a). Scientific collaboration networks. II. Shortest paths, weighted networks, and centrality. *Physical Review E*, *64*(1), 016132. doi:10.1103/PhysRevE.64.016132

Newman, M. E. J. (2001b). Scientific collaboration networks. I. Network construction and fundamental results. *Physical Review E*, *64*(1), 016131. doi:10.1103/PhysRevE.64.016131

About the reviewer: Dr. Hilbert is writing this review from the Santa Fe Institute (SFI), New Mexico, where he spends the summer pursuing a multidisciplinary approach to understanding the role of information, communication, and knowledge in complex social systems. He has published several books and peer-reviewed Journal articles on the social role of information and communication technologies, and has provided hands-on technical assistance to Heads of States, government officials, legislators, diplomats, private sector, and civil society organizations in some 30 countries. He holds a permanent appointment as Economic Affairs Officer of the United Nations and has recently joined the University of Southern California (USC). His work has been featured in Science, Scientific American, The Wall Street Journal, The Economist, Washington Post, NPR, BBC, Die Welt, Correio Braziliense, La Repubblica, El Pais, among others. More: http://www.martinhilbert.net